KI 3600 Series
Power Meter

KI 3800 Series
Light Source

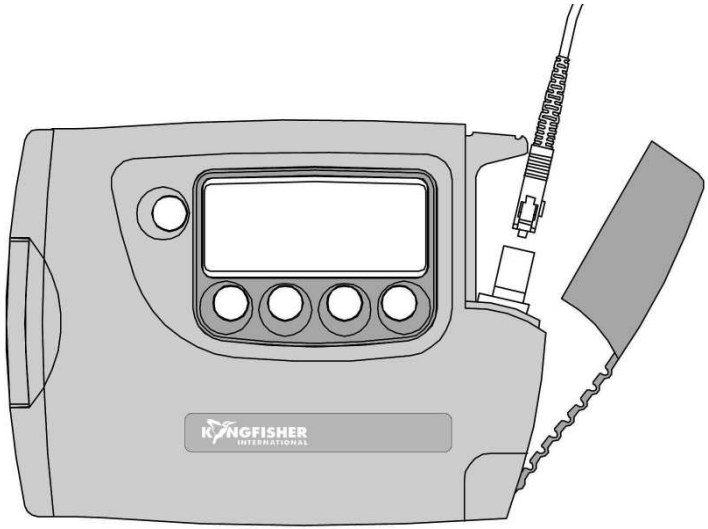
OPERATION & MAINTENANCE GUIDE

KINGFISHER INTERNATIONAL

KI 3600 Series Optical Power Meter

KI 3800 Series Optical Light Source

Congratulations on your purchase of this instrument, which has been engineered to provide the best possible reliability, convenience and performance. To get the best use from your equipment and ensure its safe operation, please spend a few minutes to read this manual.



6th Edition, May 2009.

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SERVICE AND SUPPORT

Applications Support

Please visit www.kingfisher.com.au to see our comprehensive **Application Notes** written to support instrument users.

Look at www.kingfisher.com.au to find distributor details from the **Contact Us** section.

Our local agents are able to offer excellent applications advice in your language and time zone.

Please visit our website on www.kingfisher.com.au for a current list of regional service centres.

Otherwise if you are having difficulties please feel free to contact sales@kingfisher.com.au for applications support.

Instrument Service

Qualified personnel must perform adjustment, maintenance or repair of this product. To obtain service, please contact your local Kingfisher International distributor or our office in Australia:

Tel: (61) 3-9757-4100
Fax: (61) 3-9757-4193
Email: sales@kingfisher.com.au

If returning equipment to Kingfisher International for service or calibration, please download and complete the Return Material Authorization Form located on the **Support** page on our web site www.kingfisher.com.au .

To avoid delays and minimise disruption for our customers, Kingfisher International offers a fixed price repair service.

For the staff at our fully equipped service and calibration centre, it is their pleasure to keep your equipment performing at its very best.

INTRODUCTION AND APPLICATIONS

General

The KI 3000 Series Optical Power Meters and Optical Light Sources are used to test all types of fiber optic systems:

- Tx / Rx absolute power levels in dBm
- Optical loss in dB
- Continuity testing with the test tone features

The instruments offer an exceptional level of convenience and productivity in these applications and are for use by installers, technicians and engineers. They feature superb measurement confidence, ease of use and reduced cost of ownership.

The interchangeable optical connectors are drop protected during use, are dust protected by a snap on cover, and are easily disassembled for cleaning. A wide variety of connector styles are available, including 1.25 mm LC and MU styles.

Autotest mode on both source and meter enables automatic wavelength detection and attenuation measurement.

Both instruments feature very long battery life, 1200 hours for the meter and 600 hours for the source. This eliminates requirements for external power packs.

The instruments have shock absorbent corners, and a tough polycarbonate housing which has passed extensive drop testing.

Calibration can be performed by any suitably equipped laboratory without opening the instrument. The recommended re-calibration cycle is 3 years.

Power Meter features

Superior measurement confidence is achieved with a unique Total Uncertainty Specification, which covers the full temperature, measurement and connector range, and a NATA/ILAC traceable calibration certificate is supplied.

Warm up period, range-changing delays and user dark current zeroing are all eliminated.

The sensitive optical tone detector displays the actual measured tone frequency in Hz. If a standard tone is detected, the buzzer sounds, which is useful for fiber identification and continuity testing.

Power stability testing can be performed using the max/min recording function. The display can show dBm, dB and linear units, and can be put on hold for convenient data recording.

Standard power meters work with fiber core diameter up to 200 micron, with both PC and APC polish connectors.

The special KI 3600XL version has a large area detector and traditional screw-on connector adaptors suitable for various applications, including ribbon fiber, MT-RJ connectors, large core fiber and any special connector requirements. It has higher power handling capacity. This manual refers to the KI 3600 except where specifically mentioned.

The InGaAS detector is the most common detector for general use.

Detector options include Germanium (Ge), Indium Gallium Arsenide (InGaAs), Silicon (Si), and various attenuated versions.

Power meter calibration options are available from 600 nm to 1650 nm and power levels from +30 to -70 dBm.

Light Source features

Dual wavelength sources have switchable wavelengths through one port, which makes operation faster.

Laser sources at 1310 / 1550 nm are used for testing single mode fiber systems.

LED sources at 850 / 1300 nm are used for testing multimode fiber systems.

The 1300 nm LED can also perform short distance single mode testing.

Light source features re-connection repeatability of 0.1dB. Combined with their excellent stability, this provides more accurate measurement results.

GENERAL SAFETY SUMMARY

The following safety signs and symbols specify general safety precautions which must be observed during all phases of operation, service and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of the instrument. Kingfisher International assumes no liability for the customer's failure to comply with these requirements.

Before operation, review the instrument and user manual for safety instructions. You must follow these to ensure safe operation and to maintain the instrument in safe condition.

WARNING!

The **WARNING!** sign denotes a hazard. It calls attention to a procedure, practice or the like, which, if not correctly performed or adhered to, could result in injury. Do not proceed beyond a **WARNING!** sign until the indicated safety conditions are fully understood and met.

CAUTION!

The **CAUTION!** sign denotes a hazard. It calls attention to an operating procedure, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part, or all, of the product. Do not proceed beyond a **CAUTION!** sign until the indicated conditions are fully understood and met.

Safety Symbols

The apparatus will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the apparatus against damage.

Initial Inspection

Inspect the shipping container for damage. If there is damage to the container or cushioning, keep them until you have checked the contents of the shipment for completeness and verified the instrument both mechanically and electrically. If the contents are incomplete, mechanical damage or defect is apparent, or if an instrument does not pass the operator's checks, notify the nearest Sales/Service Office.
To check instrument performance, please refer to **Performance Verification Tests** section of this manual.

WARNING! You must return instruments with malfunctions to a Service Centre for repair and calibration.

GENERAL SAFETY SUMMARY

Operating Environment

The range of Kingfisher equipment covered by this manual can be operated at temperatures between -15 °C and +55 °C and at relative humidity of <95 %.

Storage & Shipment

The range of Kingfisher equipment covered by this manual can be stored or shipped at temperatures between -25 °C and +70 °C and at relative humidity of less than 95 %. Protect the units from temperature extremes that may cause condensation within it.

Safety

These instruments contain no hazardous optical or electrical items. When using this equipment, optical safety precautions should be observed commensurate with the maximum available source power, since most of this power can also be coupled out of the instrument.

WARNING! Observe optical safety when using high power.

Optical safety requirements at high power levels **MUST** be observed or eye damage is likely. Organisations and users operating optical equipment with these power levels **MUST** determine and observe relevant safety precautions, which are beyond the scope of this manual.

Laser and LED Safety Information

VCSEL	850 ± 20 nm
Surface emitting LED	refer current specifications
InGaAs Fabry - Perot laser	1310/1490/1550 ± 20 nm
Max CW output power[1]	
850 nm	0.631 mW
1310/1550 nm	1.26 mW
1490 nm	0.398 mW
Laser Class according to	
IEC 60825-1 (2001) – International	
850 nm	class 1
1310/1490/1550 nm	class 1
21 CFR 1040.10 (1995) – USA	
850 nm	class 1
1310/1490/1550 nm	class 1
Maximum permissible CW output power[2]	
IEC 60825-1 (2001) - International	
850 nm, class 1	0.78 mW
1310 nm, class 1	15.6 mW
1490/1550 nm, class 1	10 mW
21 CFR 1040.10 (1995) – USA	
850 nm, Class 1	0.76 mW
1310 nm, Class 1	2 mW
1490/1550 nm, Class 1	8.1mW

Note 1: Maximum CW output power is defined as the highest possible optical power that the Source can produce at its output connector. Refer to specification sheet for actual operating power

Note 2: Maximum permissible CW output power is the highest optical power that is permitted within the appropriate laser class. Refer to specification sheet for actual operating power

In the USA, laser / LED sources specified by this data sheet are classified as Class 1 according to 21 CFR 1040.10 (1995). Internationally, the same laser sources are classified as Class 1 according to IEC 60825-1 (2001).

WARNING!

Optical power levels in fiber optic systems can cause permanent eye injury and damage to eyesight.

Never look into the end of an optical cable or connector which might be attached to an active source.

Do not enable a laser when there is no fibre attached to the optical output connector. Optical magnifying instruments (eg microscope) increase eye hazard. Disconnect the source before using an optical magnifier. The laser module has a built-in safety circuitry which will disable the optical output in the case of a fault condition, however, this cannot be guaranteed. An equipment assurance program is recommended to check for safe laser operation.

BATTERY POWER

These instruments are powered by two 1.5 V dry Alkaline 'C' size batteries

Model	Battery run time in hours
KI 3600 Optical Power Meter	1200
KI 3800 Optical Light Source	600 Hrs in Autotest

About 30 % capacity is obtained when using 2x 'AA' alkaline cells batteries and supplied adaptors, or 50 % capacity when using 2 x 1.2 V rechargeable NiMH 'C' size batteries.

When the batteries are low, the low-battery indicator is shown on the display. At this stage, there is approximately enough energy for another **100** hours of use.

To save energy, the instrument automatically turns off after 10 minutes without operation.

To change the batteries, open the cover of the battery compartment at the side of the instrument, remove the batteries and insert new ones.

CAUTION!

Do not use lithium batteries or other batteries with a nominal voltage greater than 1.8 V. The instrument may be damaged.

Protect our environment! Some batteries contain toxic heavy metals, so please dispose of them by returning to a re-cycling centre. Batteries purchased from Kingfisher agents can be returned to them for appropriate disposal.

OPTICAL CONNECTOR

To access the optical connectors, grasp the top right corners of the instrument, and pull off the covers.

The optical port is mounted on a swivel, which allows the connector to be angled outwards for accessibility, and then pushed back and covered with the snap cover to provide dirt and drop protection.

To install an adaptor, align the locating slot on the side of the through adaptor with that on the instrument connector, and press it on.

To remove an adaptor, move the connector port to its mid-way point, press button on the back of the instrument and then pull off the adaptor. With some styles of connector, it is easier to pull off the adaptor with a test lead in place, since this gives better grip.

On older models without the release button, move the connector port to its mid-way point, then pull off the adaptor.

Different styles of connector adaptor (ST, SC, FC, D4, MU, LC/F3000, E2000/LSH, SMA 905/906, LSA/DIN) can be easily fitted by the user.

When not in use, keep the test port and connectors covered. Do not touch connector tips with your fingers, since body oils and dirt can impair connector performance.

The supplied standard adaptors have ceramic sleeves and do not cause metal dust contamination. Connector contamination can cause connector failure and fiber fuse at very high power levels. Ceramic connector sleeves also work better in cold conditions.

CAUTION! Do not use damaged or incompatible connectors.

Power Meter

A power meter can be used with **both** PC **and** APC connector styles.

Bare fiber adaptors must achieve fiber eccentricity of ± 100 microns, and end tolerance of ± 300 microns relative to the ferrule end. Preferred bare fiber adaptors consist of a connector with fiber retention device or other end stop.

For regular work with bare fibers, it is preferable to use an alternative arrangement such as a multimode pigtail with a v-groove or mechanical splice.

CAUTION! Do not scratch the detector lens with glass fiber end when using bare fiber adaptors, or the instrument will be permanently damaged.

Light Source

A light source is **either** PC **or** APC connector specific. This is determined when ordering the instrument.

CAUTION! The use of bare fiber adaptors with the source is not recommended as permanent instrument damage will occur.

OPTICAL CONNECTOR

How to clean the optical connectors

Always clean the mating connector tip and ferrule before mating, using approved materials.

CAUTION! Do not attempt to clean an optical interface with anything hard that could scratch glass, or permanent instrument damage may occur.

Power Meter

The glass power meter interface does not make contact with the inserted connector - there is a slight air gap. Therefore it will not wear, and only needs occasional cleaning.

To clean the interface without removing the adaptor, use ' stick ' style connector cleaner . This cleans both the adaptor and end face in one operation.

Alternatively, first remove the interchangeable adaptor to access the glass interface.

Then use a soft brush, alcohol, air can or sticky material such as 'Blu tac' to remove dirt on the glass end face.

Light Source

WARNING! Disable source when cleaning optical interface. Remove batteries before using a microscope to inspect instrument connector.

To clean the interface without removing the adaptor, use ' stick ' style connector cleaner . This cleans both the adaptor and end face in one operation. Alternatively, first remove the interchangeable adaptor to access the glass interface. Then blow away any dust or dirt with compressed air. If this is not sufficient, then clean the interface by rubbing a lint-free lens cloth over the surface using small circular movements.

GETTING STARTED AND TURNING ON

This section will show you how to use your instrument:

To access the optical connector, grasp the top right corner of the instrument, and pull off the cover. The connector can be swivelled to improve access. Check that an optical connector adaptor has been fitted.

Put the batteries into the instrument. To turn instrument on, press the [POWER] button. The display will briefly show the firmware version. If the battery is low, this will be indicated on the display with a battery symbol. Pressing [POWER] again will turn the instrument off.
Should the instrument fail to turn on, the microprocessor may need re-booting. To do this, remove the batteries for at least 40 seconds.

Power Meter

To turn on all display segments, press and hold [λ ▸] during instrument turn-on.

To switch on the KI 3600 Power Meter for permanent operation, press and hold [2nd], then press and release [POWER] during turn-on. 'Perm' on the display indicates that the unit will stay on permanently.
After turn-on, the instrument performs a self-calibration sequence, and then displays absolute power in dBm at the previously set wavelength. If 'HI' or 'LO' are displayed, the input is out of range.

To disable or enable the buzzer, press and hold [2nd], then press and release [POWER].
Power Meter requires no warm up, and no user adjustment of dark current to achieve its specified performance.

Light Source

To turn on all display segments, press and hold [MOD KHz] during instrument turn-on.

To switch on the KI 3800 Light Source for permanent operation, press and hold [PERM ON], then press and release [POWER] during turn-on. 'Perm' on the display indicates that the unit will stay on permanently. To enable source emitter, press [Sourceλ].

WARNING! Do not enable a laser when there is no fibre attached to the optical output connector.

To disable or enable the buzzer, press and hold [MOD KHz], then press and release [POWER] while source is off.

The light source may require a warm up period at the set wavelength for 15 min to achieve specified stability.

AUTOTEST OPERATION

Autotest is the easy way to perform optical loss testing when an Autotest compatible light source and power meter are available.

Autotest performs automated loss measurement and wavelength detection by data exchange between the light source and power meter.

It remains synchronised for about 8 seconds after disconnection to give the user time to change optical connections without re-starting Autotest each time. This provides productivity gains.

All Kingfisher equipment featuring Autotest is compatible. Any Autotest source will work with any Autotest meter, as long as both have compatible wavelengths.

To initiate Autotest operation, connect light source and meter with a test lead and turn them on. On the light source, press [Auto test]. This is all that is required.

Power Meter

The meter will then automatically set to the correct wavelength and display absolute power in dBm. If a multi- wavelength light source is used, the display will alternate between wavelengths. To display only one wavelength at a time, press [◂ λ] to display first wavelength, then press [◂ λ] once more to display second. “nm” and ‘Hold’ will flash alternately to show that the displayed wavelength is locked.

Press [λ ▸] once to display first wavelength again or press [λ ▸] twice to unlock both wavelengths and return to Autotest.

The transmitted power from the light source will be displayed on the left hand side of the power meter display. Press [Abs/Rel] to make the meter display relative power.

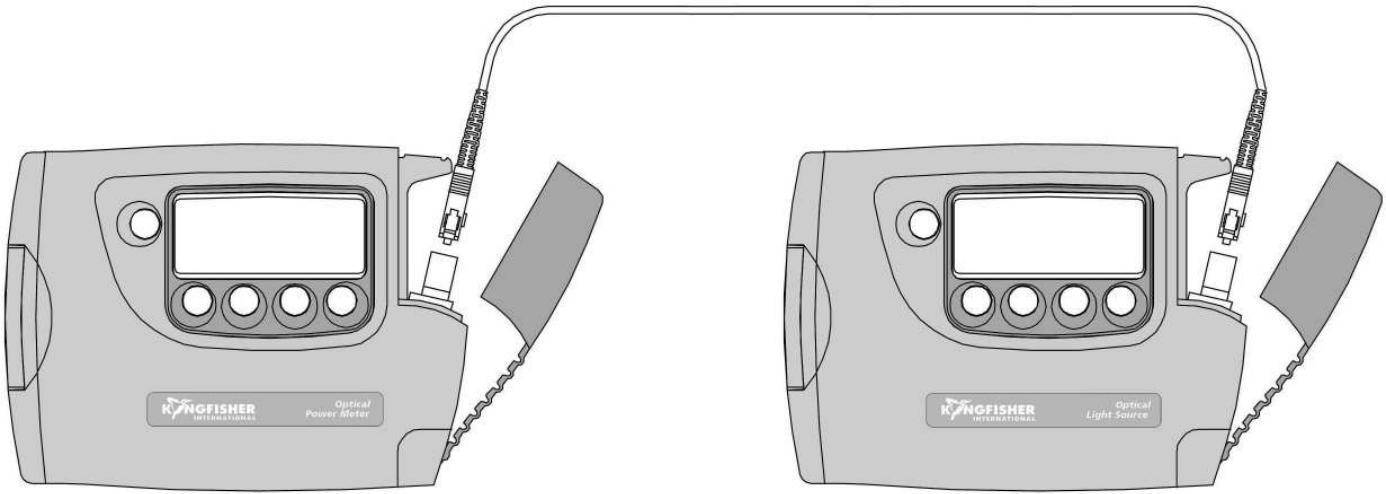
To take a reference under Autotest, press and hold [2nd] and then press [SET REF] on the meter. This will store the reference at all relevant wavelengths.

If a multi- wavelength light source is used, Auto will be displayed in the centre of the light source display and the alternating wavelengths will be shown in the top right hand side.

To exit Autotest mode, either disconnect the optical test lead, or exit Autotest mode on the light source for > 8 seconds.

Light Source

To exit Autotest mode, press [Auto test] or [MENU], then press [Source λ] to switch on source.



KI 3600 Series Power Meter

KI 3800 Series Light Source

POWER METER OPERATION

The mode of operation described below is typically used to measure Tx / Rx absolute power levels, to perform continuity testing with the tone detector, or if an Autotest light source is not available. To measure the operational power level in a fiber optic system, the meter is used in dBm or linear modes. To measure optical loss or attenuation, the power meter is used in dB mode, and the source power is taken as a reference.

WARNING! Observe optical safety procedures relevant to the power levels being measured, especially for the high power H3 meter

After instrument turn-on, the power meter is operational at the last used wavelength.

- To scroll the wavelength, press [◂ λ], or [λ ▸]. The display shows the nominal wavelength in nm on the top right of the display.
- To toggle absolute / relative display mode, press [Abs/Rel]. The display will show 'dB R' or 'dBm'.
- To stop / start display update, press [Hold]. The symbol will flash when the display is on hold.
- To set reference, press and hold [2nd] and then press [SET REF].
- When in reference mode, the reference value is displayed on the left hand side of the display.
- To toggle log/linear display mode, press and hold [2nd] and then press and release [dB mW].This function does not operate when in Autotest.
- To display the Max Min recorded power, press and hold [2nd], then press and release [Max Min]. To reset this function press and hold down [2nd] and [Max Min] for 3 seconds. This function does not operate when in Autotest.
- If the meter detects a test tone higher than 150 Hz, the display will change to show the actual measured modulation frequency in Hz.
- Maximum displayed frequency is 9999 Hz.
- If a standard tone is detected (eg 270 Hz, 1 KHz, 2 KHz), a buzzer will sound. This is useful for fiber identification and signalling. The meter can also be used to check the actual modulation frequency of test sources.

LIGHT SOURCE OPERATION

The mode of operation described below is typically used to perform continuity testing with the test tone generator, or if an Autotest compatible power meter is not available:

- After instrument turn on, the display shows 'OFF'.
- The source is scrolled using [SOURCE λ].
- Operating wavelengths will be shown in the top corner on the right hand side and source power level on the left hand side.
- To modulate the source, press [MOD KHz].
- Modulation is active only while the source is enabled.
- To select a modulation frequency, press [MOD KHz] to scroll through available settings: 0.27 KHz, 1 kHz, 2 kHz to off (CW).

Laser Output Power Adjustment

To adjust the laser output power, turn the laser 'on', then press and hold the [PERM ON] button while pressing [MOD KHz] to increase the output power, or [SOURCE λ] to decrease the output power.
Note: This function does not operate when in Autotest.

Note: This function is not available on the LED source option.

CARE OF YOUR INSTRUMENT

- Follow the directions in this manual on optical connector care.
- Use only high quality sealed alkaline or NiMH batteries.
- During prolonged storage, remove batteries to eliminate the possibility of acid leakage.
- During storage and transport, keep the instrument in its carry case to protect against crushing, vibration, dust and moisture.
- The instrument is resistant to normal dust and moisture, however it is not waterproof. If moisture gets into the instrument, dry it out carefully before using it again.
- Where possible, keep instrument away from direct sunlight.
- Clean the instrument case using alcohol or other non solvent cleaning agents. Acetone or other active solvents may damage the case.
- The instrument housing is made of tough polycarbonate material with impact absorbing rubberised corner features and is therefore drop resistant.

Power Meter

- Input optical power must not exceed the damage level specified for each detector type.

ACCURACY CONSIDERATIONS

All Measurements

Keep optical connectors clean and in good condition. APC connectors will generally provide improved power stability on single mode systems.

To reduce the effect of polarisation changes, the system should be neat, coiled and physically stable.

In multimode systems, modal noise and general uncertainty are much worse than in single mode systems. Optimum measurement repeatability will be obtained by use of a mandrel wrap.

Wavelength uncertainty affects power meter calibration. This is significant with a Ge detector in the 1550 nm band (eg > 1560 nm in cold weather).

For general measuring from 660 to 1550 nm, the Ge meters offer adequate accuracy.

For better accuracy or linearity, or wavelengths above 1550 nm, the InGaAs meter is preferred.

For high power testing, the H series offer excellent accuracy, power handling, wavelength and connector reflections insensitivity.

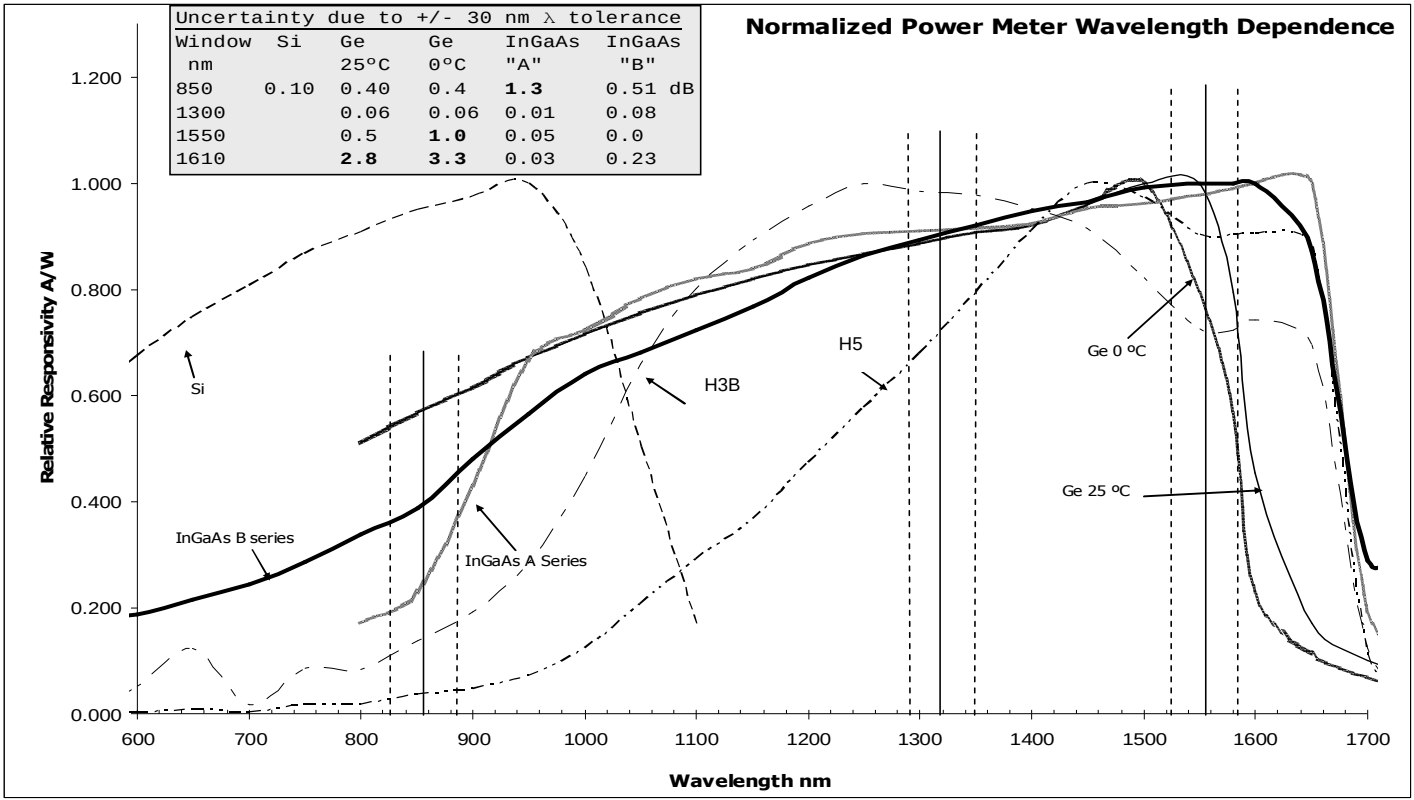
Light source power may drift. When you have finished a test, go back to the start position to check if the light source power is still within acceptable limits. Specifications are for typical drift, warm up, and with a specified level of return loss. Actual drift will vary between instruments and test situations.

Most available laser sources are sensitive to reflections. Varying reflections can induce laser source instability of around 0.3 dB. This is very difficult to verify without a special test system, but can cause errors. Reduced reflection will result in improved repeatability.

Due to emitter centre wavelength uncertainty (eg ± 20 nm), fiber attenuation may vary with different light sources.

ACCURACY CONSIDERATIONS

Uncertainty due to +/- 30 nm λ tolerance					
Window nm	Si	Ge 25°C	Ge 0°C	InGaAs "A"	InGaAs "B"
850	0.10	0.40	0.4	**1.3**	0.51 dB
1300		0.06	0.06	0.01	0.08
1550		0.5	**1.0**	0.05	0.0
1610		**2.8**	**3.3**	0.03	0.23



Power Meter

Power Range: the range of input powers for which the instrument can be used.

Maximum Input Power: the input power not to be exceeded to avoid destroying the instrument.

Uncertainty at Reference Conditions: the uncertainty for the specified set of reference conditions, which includes all uncertainties in the calibration chain, from the national laboratory to the test meter (connectors and test leads must be absolutely clean and undamaged). Reference conditions are the conditions during the responsivity calibration.

Total Uncertainty: the uncertainty for a specified set of operating conditions which includes noise and drift (connectors and test leads must be absolutely clean and undamaged).

Autotest Sensitivity: the power level below which Autotest does not work.

Light Source

Output Power: the CW output power at the specified wavelength at the end of a reference cable.

Power Uncertainty / Repeatability: the uncertainty in power level at the end of a reference cable.

Short / Long Term (Power) Stability: in CW mode, the uncertainty of the power level observed over a given time, compared to the mean power during this time. Measured with an averaging optical power meter, a 9/125 or 62.5 µm fiber, at constant temperature, and within a specified temperature window.

Centre wavelength: the wavelength representing the centre of mass of the selected peaks**:**

$$\lambda_{cw} = (1/P_o)\Sigma(P_i \lambda_i)$$

where P_i and λ_i are the power and wavelength of each spectral component and P_o is the total power.

Spectral Bandwidth: FWHM (full width at half the maximum), describes the spectral width of the half-power points of the laser, assuming a Gaussian envelope of the spectral power distribution. The half-power points are those where the power-spectral density is one half of the peak amplitude of the Gaussian curve:

$$\Delta\lambda_{RMS} = \left(\frac{\Sigma P_i \lambda_i^2}{P_{total}} - \lambda_{center}^2 \right)^{1/2}$$

and

$$\Delta\lambda_{FWHM} = M \Delta\lambda_{RMS}$$

where: λ_{center} = center wavelength of laser diode (in vacuum)
$P_{total} = \Sigma P_i$ = total power, in watts
P_i = power of i^{th} longitudinal mode
λ_i = wavelength of i^{th} longitudinal mode (in vacuum)
M = multiplication factor; for a source with a Gaussian envelope $M = 2.35$; for other types of spectra, use $M = 2.35$ as well.

SPECIFICATIONS

General Specifications:

Size:	165 x 120 x 40 mm, 6.5" x 4.7" x 1.6".
Weight:	350 gm, 0.8 lb. (KI3600XL 400 gm, 0.9 lb). Shipping 0.7 Kg, 1.5 lb.
Operating/ Storage:	-15 to 55 °C / -25 to 70 °C.
Power:	2 alkaline 'C' cells 7.6 A/hr, (or 2 'AA' cells using optional adaptor). Selectable auto-off and low battery indicator.
Case:	Polycarbonate, 1 meter drop tested.
Calibration:	Performed without opening instrument. Recommended calibration cycle: 3 years.
Display:	4 digit high contrast LCD
Resolution:	Log: 0.01dB Linear: 3 digits (100-999) or 0.01 nW
Power Meter:	
Tone detection:	150 ~ 9999 Hz ±1%.

SPECIFICATIONS

KI 3800 Series Optical Light Source

	1310/1550 Laser	Other Laser	850 nm VCSEL	850/1300LED	660 nm LED	Comment
Output Power, dBm/ Fiber type, mm	0 @ 9/125	-4 @ 9/125	-2 @ 50/125	-23 @ 62.5/125•m -35 @ 9.5/125•m	-6 @ 1000 POF	± 1 dB for all, except LED ± 3 dB for 850/1300 nm LED
Short term, Stability, dB	0.04[1]	0.06[1]	0.12[1]	0.01 dB	0.01	For 15min typical, ± • 2 °C, after warm-up
Stability over temp, dB	0.6	0.6	0.8	0.35	0.35	Typical, over temperature
λ initial tolerance, nm	20	20	20	NA	5	at 25 °C
λ width, nm	3	< 1	< 1		10	FHWM, typical
λ nm/°C	0.4	0.1	0.1	0.4	NA	typical
Coupled Power Ratio (CPR)	NA		Mode controlled[2]		NA	
Reconnection repeatability, dB	0.1			0.05		95% confidence
Modulation	270 Hz, 1 KHz, 2 KHz, ± 2 %					
Laser output	Adjustable over 3 dB in 0.05 dB steps					

Note 1: ORL < - 25dB

Note 2:Multimode source mode distribution @ 50/125is compliant with the following standards: IEC 61280-4-1, TIA/EIA 526-14A and TIA TSB-178.

SPECIFICATIONS

KI 3600 Series Optical Power Meter

Detector type	Response λ nm	Damage level dBm	Calibration λ nm	Power range dBm	Autotest sensitivity dBm	Mid range linearity[1] dB	Calibration Accuracy[2] %	Polarisation Sensitivity dB	Total Uncertainty[3] dB	λ Sensitivity[5] ± 30 nm dB
Si	350 ~ 1100	+15	**635, 650, 660, 780, 850, 980**	+0 ~ -70	-47	0.02	2 %	< 0.005	0.3	0.03
Ge	600 ~ 1600	+15	***660, 850*** **1300, 1310, 1390, 1490, 1550, 1590, 1610, 1625**	*+10 ~ -65* +10 ~ -70	*-45* -50	0.04	2 %	< 0.005	0.5	0.04
InGaAs	800 ~ 1700	+15	***660, 850*** **1300, 1310, 1390, 1490, 1550, 1610, 1625**	*+5 ~ -60* +5 ~ -70	*-40* -50	0.02	2 %	< 0.005	0.3	0. 03
H3B (InGaAs)	800 ~ 1700	+30[4]	***850*** **1300, 1310, 1390, 1490, 1550,1590, 1610, 1625**	+27 ~ -50	-30	0.02	2 %	< 0.005	0.3	0. 03
H5 (InGaAs)	800 ~ 1700	+25	***850*** **1300, 1310, 1390, 1490, 1550,1590, 1610, 1625**	*+15 ~ -50* +15 ~ -60	*-30* -40	0.02	2 %	< 0.005	0.3	0. 03
					typical	*typical*		*typical*	*max*	*typical*

Note 1: Mid range linearity excludes top 3 dB and bottom 10 dB of range.

Note 2: Calibration condition: non coherent light, -35 ± 5 dBm, 23 ± 1˚C, ± 1 nm, 10 ± 3 nm FWHM, PC ceramic connector, 100 µm fiber

Note 3: Includes contributions due to: varying optical connector types, calibration uncertainty, full temperature, dynamic range and fiber core diameter up to 200 µm.

Note 4: H3B can sustain the damage level for 2 minutes.

Note 5: At calibration wavelengths in bold type

SPECIFICATIONS

KI 3600XL Series Optical Power Meter

Detector type	Response λ nm	Damage level dBm	Calibration λ nm	Power range dBm	Autotest sensitivity dBm	Mid range linearity[1] dB	Calibration Accuracy %	Polarisation Sensitivity dB	Total Uncertainty[3] dB	λ Sensitivity[2] ± 30 nm
2.5 mm Si	350 ~ 1100	+10	**635, 650, 660, 780, 850, 980**	+5 ~ -60	47	0.02	2 %	< 0.005	0.3	0.03
2 mm Ge	600 ~ 1600	+15	**780, 850** **1300, 1310, 1390, 1490, 1550, 1590, 1610**	+10 ~ -55 +10 ~ -60	45 -50	0.04	2 %	< 0.005	0.5	0.04
2 mm InGaAs	800 ~ 1700	+15	**850** **1300, 1310, 1390, 1490, 1550, 1610,1625**	+10 ~ -65 +10 ~ -70	45 -50	0.02	2 %	< 0.005	0.3	0.03
2 mm H2 (Ge)	600 ~ 1600	+33[4]	**850** **1300, 1310, 1390,1490,1550,1590,1610**	+30 ~ -40 +30 ~ -50	-20 -30	0.04	2 %	< 0.005	0.5	0.04
2 mm H3 (InGaAs)	800 ~ 1700	+33[4]	**850** **1300, 1310,1390,1490, 1550, 1610,1625**	+30 ~ -40 +30 ~ -50	-20 -30	0.02	2 %	< 0.005	0.3	0.03
					typical	*typical*		*typical*	*max*	*typical*

Note 1: Mid range linearity excludes top 3 dB and bottom 10 dB of range.

Note 2: At calibration wavelengths in bold type

Note 3: Includes contributions due to: varying optical connector types, calibration uncertainty, full temperature, dynamic range and fiber type up to 200 µm core diameter.

Note 4: H2 and H3 can sustain the damage level for 2 minutes.

SPECIFICATIONS

KI 3600WS Wavelength Selective Power Meter

General Specifications

Size:	165 x 120 x 40 mm, 6.5" x 4.7" x 1.6".
Weight:	350 gm, 0.8 lb. Shipping 0.7 Kg, 1.5 lb.
Operating/ Storage:	-15 to 55 °C / -25 to 70 °C.
Power:	2 'C' cells or 2 'AA' cells with optional adaptor.
Operating time:	1200 hours
Case:	Polycarbonate, 1 meter drop tested.
Warranty	3 years
Calibration interval	3 years

Measurement accuracy

	KI 3600WS21-Ge	KI 3600WS01-Ge
Mid range linearity	0.04 dB	
Calibration accuracy	2 %	
Polarization sensitivity	<0.005 dB	
Total uncertainty	0.6 dB	0.5 dB
Reconnection repeatability	0.1 dB	0.0 dB
ORL	> 55 dB	> 55 dB

Port connection capability	APC	PC and APC

Measurement of 1490 nm (downstream)

	KI 3600WS21-Ge	KI 3600WS01-Ge
Calibrated wavelengths	1490 nm, 1550 nm	1550 nm
Pass band, nm	1480 to 1500	
Isolation of 1550 nm band	> 25 dB	
Isolation of 1310 nm band	> 30 dB	
Max permitted input level	+ 18 dBm	
Measurement range	+13 to -67 dBm	

Measurement of 1550 nm (downstream)

	KI 3600WS21-Ge	KI 3600WS01-Ge
Calibrated wavelengths	1490 nm, 1550 nm	1550 nm
Pass band, nm	1530 to 1625	1530 to 1625
Isolation of 1490 nm band	> 25 dB	> 25 dB
Isolation of 1310 nm band	> 30 dB	> 30 dB
Max permitted input level	+ 18 dBm	+ 15 dBm
Measurement range	+ 13 to - 67 dBm	+ 10 to - 70 dBm

ORDERING INFORMATION

KI 3600 Series - Optical Power Meter:

Si Power Meter	**KI 3600B - Si - MP**
Ge Power Meter	**KI 3600B - Ge - MP**
InGaAs Power Meter	**KI 3600B - InGaAs - MP**
H3B (InGaAs) Power Meter	**KI 3600B - H3B - MP**
H5 (InGaAs) Power Meter	**KI 3600B - H5 - MP**

KI 3600XL Series – Optical Power Meter:

Large area Si Power Meter	**KI 3600XL - Si - MP**
Large area Ge Power Meter	**KI 3600XL - Ge - MP**
Large area InGaAs Power Meter	**KI 3600XL - InGaAs - MP**
Large area H2 (Ge) Power Meter	**KI 3600XL - H2 - MP**
Large area H3 (InGaAs) Power Meter	**KI 3600XL - H3 - MP**

KI 3600WS Wavelength Selective Power Meter:

Ge Power Meter,1550 nm	KI3600WS01-Ge
Ge Power Meter,1490/1550 nm	KI3600WS21-Ge

KI 3800 Series - Optical Light Source:

660 nm LED, 1mm POF, fixed SMA	**KI 3809 - MP**
850 nm LED, PC	**KI 3810B - MP**
850 / 1300 nm LED, PC	**KI 3812B - MP**
1310 nm Laser, PC	**KI 3820B - MP**
1310 / 1550 nm Laser, PC	**KI 3822B - MP**
1310 / 1550 nm Laser, APC	**KI 3822B - APC - MP**
1490 / 1550 nm Laser, PC	**KI 3818B - MP**
1490 / 1550 nm Laser, APC	**KI 3818B - APC – MP**
1650 nm Laser, PC	**KI 3806B - MP**
1650 nm Laser, APC	**KI 3806B - APC – MP**
850 nm VCSEL	**KI 3840B - MP**

ORDERING INFORMATION

Standard Accessories:

ST, SC, FC connector adaptors, manual, wrist strap.
NATA traceable calibration certificate (power meter).
50 μm / 62.5 μm mandrel wrap for multimode LED Light Source

Optical Connectors:

These instruments have interchangeable optical connectors. The power meter works with both PC and APC connectors. The light source ferrule type is fixed and customer - specified as either PC or APC. Green is associated with APC connectors. Order any number of additional adaptors.

Optional Interchangeable Connector Adaptors:

Description	P/N	Description	P/N
D4	**OPT055**	LC	**OPT072**
E2000/LSH, blue	**OPT060**	MU	**OPT080**
E2000/LSH, green	**OPT060G**	Universal 2.5mm	**OPT081**
LSA/DIN 47256 blue	**OPT071**	SMA 905/906	**OPT082**

Optional Accessories:

Description	P/N
Accessory Pack, containing Soft Pouch, Leather Holster,1.25 & 2.5 mm cleaning stick, Connector cleaning cloth, 'AA'-to-'C' Battery Converter	**OPT146**
Carry case, 2 instruments	**OPT153**

Connector adaptors for KI3600XL Optical Power Meter:

Description	P/N	Description	P/N
SC	**OPT201**	Diamond 3.5mm Threaded	**OPT208**
ST	**OPT202**	E2000/LSH	**OPT220**
SMA 905/906	**OPT203**	EC	**OPT221**
FC	**OPT204**	MU	**OPT222**
Biconic	**OPT205**	MTRJ[1]	**OPT223**
D4	**OPT206**	Universal 1.25mm	**OPT224**
LSA/DIN	**OPT207**	Universal 2.5mm	**OPT225**

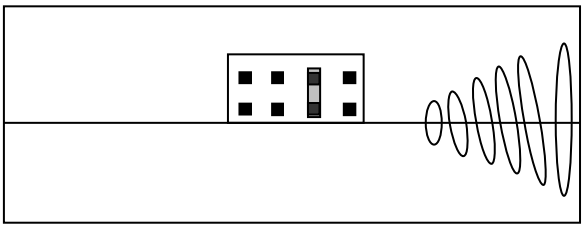
Note 1. Optimised for KI 3600XL-Si meter. Please enquire for other connector styles for KI3600XL.

To order a KI 3600XL series instrument, please specify part number and at least one interchangeable adaptor + accessories. The adaptor price is not included.

There are no internal user adjustments. Calibration is performed without opening the instrument.

All Calibrations

To enable calibration mode, open the battery compartment, remove the anti-tamper label, and insert a 2.54 mm (0.1") pitch programming shunt across pins 5 and 6 (second vertical pair from spring side). Manipulation of the shunt is easier with needle nose pliers. The instrument will display 'CAL' & installed options.



View Inside Battery Compartment

Known calibration constants can be re-entered directly without using other equipment. This is useful in case old calibration constants are to be put back.

Before commencing calibration:

- Clean all optical connectors very carefully.
- Ensure that all devices have been at a stable room temperature for over an hour, and that the light source is fully warmed up at the wavelength to be calibrated.
- Ensure that all installed batteries are in good working condition.
- When calibration is complete, remove the calibration shunt, and place an anti-tamper label over the hole in the battery compartment.
- Do not forget to update your calibration records and to schedule the next calibration service.

Power Meter Calibration

Calibration is a transfer process. It is performed by setting up a single mode laser source at a stable, but non-critical power level between 0 and -30 dBm, and adjusting the meter reading to the same value as that shown by a reference meter.

Required are laser light sources with accurate, calibrated wavelengths and good power stability, a power meter with appropriate calibrated wavelengths, single mode test leads, an anti-tamper label, and a 2.54 mm (0.1") programming jumper. Check the calibration certificates on your reference equipment to ensure current validity.

Record the existing calibration offsets, re-enter or adjust known offsets at this point or calibrate the meter at the selected wavelength as follows:

- Inserting the jumper and re-inserting the batteries will put the instrument into calibration mode and will show 'CAL' on the display.
- Press [◂ λ] or [λ ▸] to set the wavelength to be calibrated.
- Measure and record the light source power using the reference meter.
- Transfer the same power level to the meter to be calibrated as follows:
- Press [MAX MIN] to display power reading. Press [MAX MIN] again to display current offsets. Record the current (old) value. Press [MAX MIN] again, then [◂ λ] or [λ ▸] to adjust the reading to match the noted reference reading. Press [MAX MIN] again to display current offsets. Record the current (new) value.
- Note: Toggling the [MAX MIN] button will show the power reading and the offsets on the display.
- Set the new value press and hold [dB mW] until the instrument beeps (3 beeps). The display will show 'CAL' and the calibrated wavelength.
- Note: If [dB mW] is pressed and released too soon, this will cause a Cancel function and the settings will not be modified.
- Repeat above process for other wavelengths.

Light Source Calibration and Current Check

The emitter power level can be re-calibrated, and the current checked.

CAUTION! Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Record the existing calibration offsets, re-enter or adjust known offsets at this point, or calibrate the source at the selected wavelengths as follows:

- Inserting the jumper and re-inserting the batteries will put the instrument into calibration mode and will show 'CAL' on the display.
- Press [λ] to set the wavelength to be calibrated.
- Measure and record the light source power using the reference meter.
- To set the new light source power level, first press [λ] to set the required wavelength to be adjusted.
- Press [MOD KHz] to display power reading. Press [MOD KHz] again to display current offsets. Record the current (old) value. Press [MOD KHz] again, then [PERM ON] to increase or [AUTO TEST] to reduce the reading to match the noted reference reading. Press [MOD KHz] again to display current offsets. Record the current (new) value.
  Note: output power level can be adjusted to suit customer requirements (range dependant upon unit options).
- To set new value, press [MOD KHz].The display will show 'CAL' and the λ just calibrated.
- To exit, press [SOURCE λ].
  Note: new values will not be stored.
- Repeat above process for any additional wavelengths if required.

Opening the Instrument:

CAUTION!

- Do not open unless the warranty has expired, and you are authorised to do so. Opening the unit will invalidate any warranty claim.
- This unit contains static sensitive devices. Anti-static handling procedures should be observed at all times when handling internal circuits.
- There are no internal user adjustments. All calibration is performed without opening the instrument. The optical sensor / connector assembly is not user serviceable.

Procedure:

- Remove the batteries, and leave the battery cover open. Pull open the optical connector cover.
- Place the instrument face down on a soft mat, and undo the 4 screws in the rear housing.
- The instrument can now be gently pulled apart.
- Further disassembly from this stage should be easily apparent to a technician.
- Re-assembly is the reverse of the previous procedure.

General electrical parameters are as follows:

Vss to GND = 3V3, -Vss = -3V3, battery power down current about 0.2 mA, active power meter current about 25 mA.

PERFORMANCE VERIFICATION TESTS

All tests can be performed without access to the interior of the instrument.

The test procedures described in this section are for performance verification of a KI3600B-InGaAs Power Meter and KI3822B Light Source.

Due to the large number of possible instrument configurations, it is not possible to give detailed test procedures for all options in this manual, so some parameters may need adjusting to the appropriate specifications.

Required Equipment: This is the required equipment for the performance tests listed. Any equipment that satisfies the critical specifications of the equipment given in the table may be substituted for the recommended models.

Test Record: Results of the performance test may be tabulated on a photocopy of the Test Record provided at the end of the test procedure. It is recommended that you fill out the Test Record and refer to it while doing the test. Alternatively, a soft copy of this manual may be obtained from our web site.

Test Failure: If the equipment under test fails any performance test, return the instrument to the nearest Sales/Service Office for repair.

Instrument Specification: Specifications are the performance characteristics of the instrument that are certified, and are the limits against which the equipment under test can be tested.

Any changes in the specifications due to manufacturing changes, design, or traceability to NATA, will be covered in a manual change supplement, or revised manual. Such specifications supersede any that were previously published.

General Instructions

Perform each step in the order given, using the corresponding test equipment. Use Tables 1 ~ 3 to record general test details.

The SMF / MMF test lead fiber type and PC / APC connector polish must be matched to the instrument type.

Ensure that all optical connections are dry and clean. **DO NOT USE INDEX MATCHING OIL**. For cleaning, use the cleaning instructions given in the section 'Optical Connector'.

Make sure that all patch cords are fixed to the table to avoid movements during measurements.

Ensure that the ambient conditions are in the following ranges:

Temperature: 21 ± 3 ºC

Relative humidity: 45 to 75 %

To switch on Power Meter for permanent operation, press and hold [2nd], then press and release [POWER] during turn-on.

To switch on Light Source for permanent operation, press and hold [PERM ON], then press and release [POWER] during turn-on.

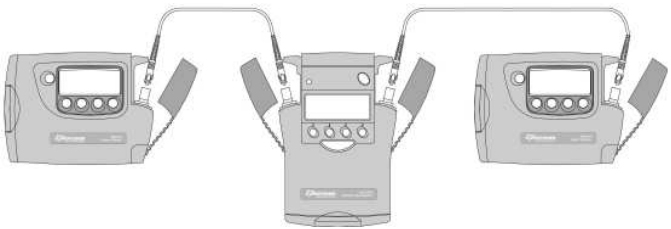
Instrument / Accessory	Recommended Model	Required Characteristics	Alternative Model
Optical Light Source	KI 3800 Series		KI 7400, KI 7800, KI 7300A
Optical Power Meter	KI 3600 Series		KI 7600A, KI 7700, KI 6000
Optical Attenuator	KI 7011B		KI 7010A
Connector Adaptors			
Singlemode Fiber			
For optional test only			
Optical Spectrum Analyzer	71450B		71452B, (8164xA,B)
Connector Adaptors			
Singlemode Fiber			

Table 1. Required Equipment for KI 3600 and KI 3800 Series Performance Verification Tests.

Optical Power Meter

Accuracy Test

1. Connect the equipment as shown in Figure 1:



Power Meter **Attenuator** **Light Source**

Figure 1.Test set-up for KI 3600 Power Meter Accuracy Test

2. Switch on all three instruments.
3. Set all instruments to 1310 nm.
4. Change the attenuation of the attenuator until the optical power meter displays -10.00 dBm. Note the attenuator setting in setting 1 of Table 4.

If the laser source is not powerful enough to give -10.00 dBm, set the attenuator to 2.5 dB and correct the appropriate values in the test report.

Repeat the above for reference power meter readings of -20dBm, -30 dBm, -40 dBm and -50 dBm (settings 2 ~ 5).

5. Measure the DUT:
   - Re-connect the attenuator output cable to the DUT.
   - Select 1310 nm on power meter.
   - Set the attenuator to its value for setting 1.
   - Note the displayed power level of the DUT in the test record.
   - Repeat the above for attenuator settings 2 ~ 5.
6. Repeat the Power Meter Accuracy Test at 1550 nm.

PERFORMANCE VERIFICATION TESTS

Model:	Date:
Serial No.:	Ambient Temperature: °C
Options:	Relative Humidity: %
Firmware Revision:	Line Frequency: Hz
Test Facility:	Customer:
Performed by:	Report No:

Special Notes:

Table 2. General Test Record for KI 3600 and KI 3800 Series

PERFORMANCE VERIFICATION TESTS

Description		Model	Trace No.	Calibration Due Date
1.	Optical Light Source			
2.	Optical Power Meter			
3.	Optical Attenuator			
4.				
5.				
6.				
7.				
8.				
9.				
10.				

Accessories:
Singlemode Fiber
Connector Interfaces

Table 3. Equipment Record for KI 3600 and KI 3800 Series Performance Verification Tests.

Model: _____ **Report No:** _____ **Date:** _____

Accuracy Test					
	Test Wavelength =				
Setting Number	Power meter Reference value	Attenuator Setting	Minimum Specification (-0.3 dB of Reference)	DUT Measurement results	Maximum Specification (+0.3 dB of Reference.)
1.	(~- 10.00 dBm)	_____ dB	(~- 10.30 dBm)	_____ dBm	(~- 9.70 dBm)
2.	(~- 20.00 dBm)	_____ dB	(~- 20.30 dBm)	_____ dBm	(~- 19.70 dBm)
3.	(~- 30.00 dBm)	_____ dB	(~- 30.30 dBm)	_____ dBm	(~- 29.70 dBm)
4.	(~- 40.00 dBm)	_____ dB	(~- 40.30 dBm)	_____ dBm	(~- 39.70 dBm)
5.	(~- 50.00 dBm)	_____ dB	(~- 50.30 dBm)	_____ dBm	(~- 49.70 dBm)
		_____		_____	
		Measurement Uncertainty		_____ dB	

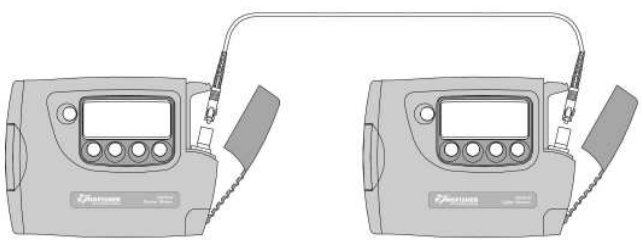
Note 1: Minimum/Maximum Specification is for the KI 3600-InGaAs. For the KI 3600-Ge, increase/reduce by ±0.2 dB. For the KI 3600-H3B, increase/reduce by ± 0.1 dB.
Note 2: For the KI 3600-Si, measurements to be taken only at 850 nm.

Table 4. Accuracy Test Record for KI 3600 Series Optical Power Meter

Optical Light Source

Output Power (CW) Test

1. Connect the equipment as shown in Figure 2.
2. Switch on the instruments.
3. Set the Optical Power Meter to 1310 nm
4. On Light Source, enable the source and set the wavelength to 1310 nm.
5. Note the measured power level value in the test report in Table 5.
6. Repeat the above on 1550 nm.



Power Meter **Light Source**

Figure 2. Test set-up for KI 3800 Light Source Output Power (CW) Test

Optical Light Source

Short Term Stability Test (optional)

1. Connect the equipment as shown in Figure 3.

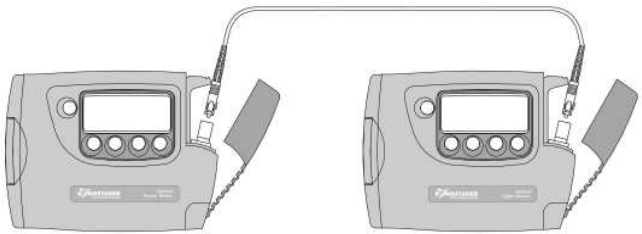


Figure 3. Test set-up for KI 3800 Light Source Short Term Stability Test

2. Set the optical power meter to 1310 nm.
3. On Light Source, enable the source and set the wavelength to 1310 nm.
4. Let the unit warm-up for 15 minutes then note the power.
5. Record the power every 30 seconds for 3 minutes.
6. Calculate max-min values for stability (< 0.1dB).
7. Record test results in Table 5.

Time	Measured power, dBm	Drift, dB	Tick max/min values
00 sec		0.00	
30 sec			
60 sec			
90 sec			
120 sec			
150 sec			
180 sec			

Alternatively, the instrument max/min recording function can be used to record the data.

Optical Light Source

Centre wavelength and Spectral Bandwidth (FWHM) Test (optional)

1. Connect the equipment as shown in Figure 4.

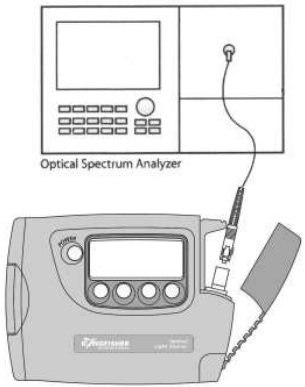


Figure 4. Test set-up for the centre wavelength and spectral bandwidth

2. Switch on the instruments and allow to fully warm up.
3. On Light Source, enable the source and set the wavelength to 1310 nm.
4. On the OSA, press the [Instr Preset] key
5. Press [Auto/Meas] and wait until 'End of Automeasure' is displayed
6. Choose [User] and select the type of source to be measured (FP for Fabry Perot laser).
7. To show the display in linear mode:
   - Press [Menu].
   - Press [Amptd] on the left side of the display.
   - Press [Linear] on the right side of the display.
8. To ensure interference - free reading of the display it is advisable to stop the repeating calculations.
   - Press [User].
   - Press [Single Sweep].

   If the trace on the display is not clear, you can change resolution by using the span key.
9. From the displayed measurements check and note the values for "mean wavelength" (Centre wavelength) and "FWHM" (Spectral Bandwidth) in the test report, Table 6.
10. Repeat the test with the DUT wavelength set to 1550 nm.

Model:	Report No.		Date:	

Output Power (CW) Test

Wavelength	Minimum Specification	DUT Measurement Results	Maximum Specification
1310 nm	-1.00 dBm	_____ dBm	
1550 nm	-1.00 dBm	_____ dBm	
Measurement Uncertainty		_____ dB	

Short-Term Stability Test (optional)

1310 nm		_____ dBpp	(0.10 dBpp) 0.04 dBpp typical
1550 nm		_____ dBpp	(0.10 dBpp) 0.04 dBpp typical
Measurement Uncertainty		_____ dB	

Table 5. Output Power Test and Short Term Stability Test Record for KI 3800 Series Light Source

Model:		Report No:		Date:	

Central Wavelength & Spectral Bandwidth (FWHM) Test (optional)

Wavelength	Minimum Spec.	DUT Measurement Results		Maximum Spec.
Centre wavelength				
1310 nm	1290 nm	_____	nm	1330 nm
1550 nm	1530 nm	_____	nm	1570 nm
Spectral Bandwidth (FWHM)				
1310 nm		_____	nm	(6nm) 3 nm typical
1550 nm		_____	nm	(6nm) 3 nm typical
Measurement Uncertainty		_____	dB	

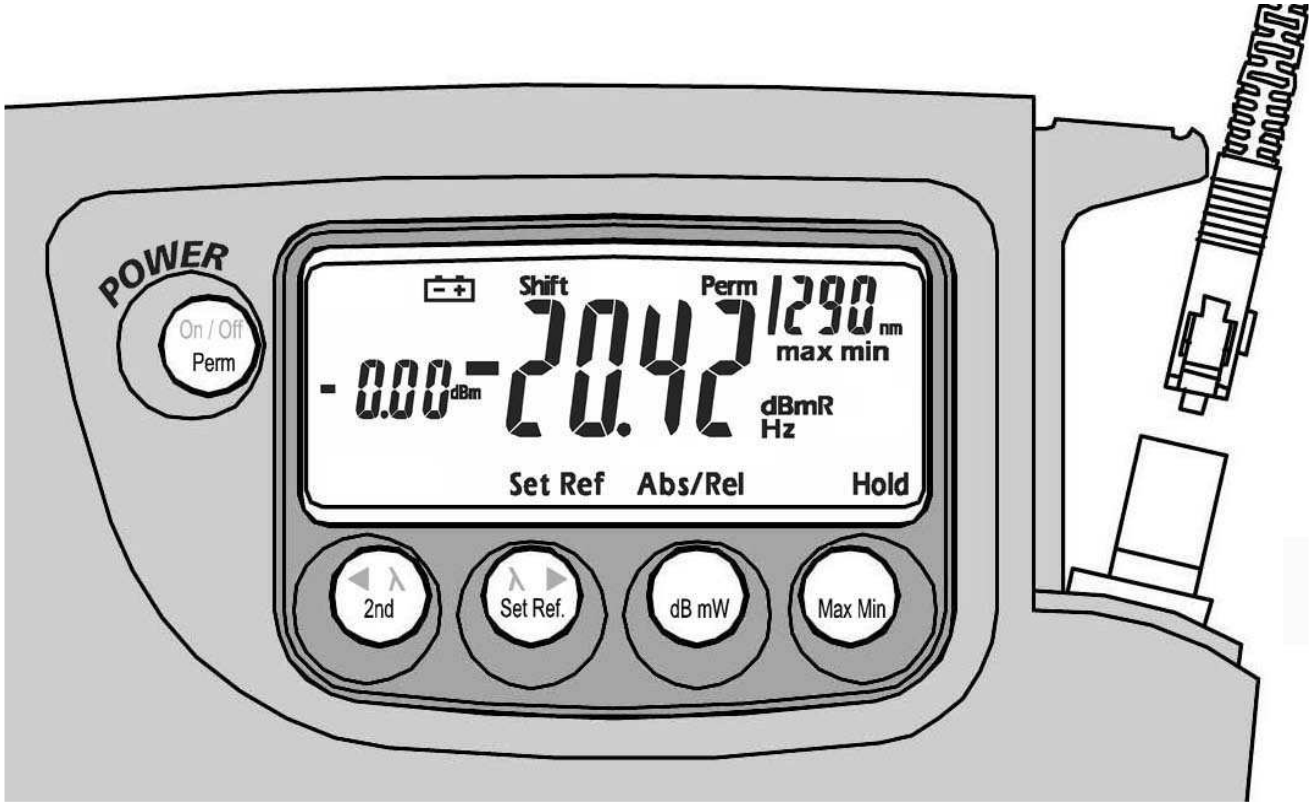
Table 6. Central wavelength and Test Record for KI 3800 Series Light Source

- To remove the **connector adaptor**, press the button on the rear of the instrument and pull off adaptor. This may be easier with a patch lead in place.
- To turn on the instrument, press [POWER].
- To defeat **auto power-off**, hold down [2nd] while pressing [POWER]. 'Perm' is displayed on the top right of the LCD.
- **Low battery** is indicated with a battery symbol.
- To **scroll wavelength**, press [◂ λ] or [λ ▸].
- To switch between **absolute or relative** display modes, press [Abs/Rel].
- To **stop / start display** update, press [HOLD].
- To **set reference**, hold down [2nd] while pressing [SET REF].
- To toggle **log/linear** display mode, hold down [2nd] while pressing [dB mW].
- To display the **max / min recorded power**, hold down [2nd] while pressing [Max Min]. To reset this function, press and hold down [2nd] and [Max Min] for 3 seconds.
- If a **test tone** is detected, the detected tone frequency is displayed in Hz.

AUTOTEST OPERATION

- To start Autotest, press [Autotest] on light source and wait a few seconds. No user action is required from the meter side.
- To **display just one wavelength** at the time on the power meter, press [◂ λ] or [λ ▸]. Press [λ ▸] twice to return to Autotest.
- Autotest remains for more than 8 seconds after signal loss, to allow quick connection change.
- To exit Autotest, remove test lead or turn off light source for more than 8 seconds.

KI 3600 Series Optical Power Meter



- To remove the **connector adaptor**, press the button on the rear of the instrument and pull off adaptor. This may be easier with a patch lead in place.
- To turn on the instrument, press [POWER].
- To turn on the source, press [SOURCE λ].
- To defeat **auto power-off**, hold down [PERM ON] while pressing [POWER]. 'Perm' is displayed on the top right of the LCD.
- **Low battery** is indicated with a battery symbol.

AUTOTEST OPERATION

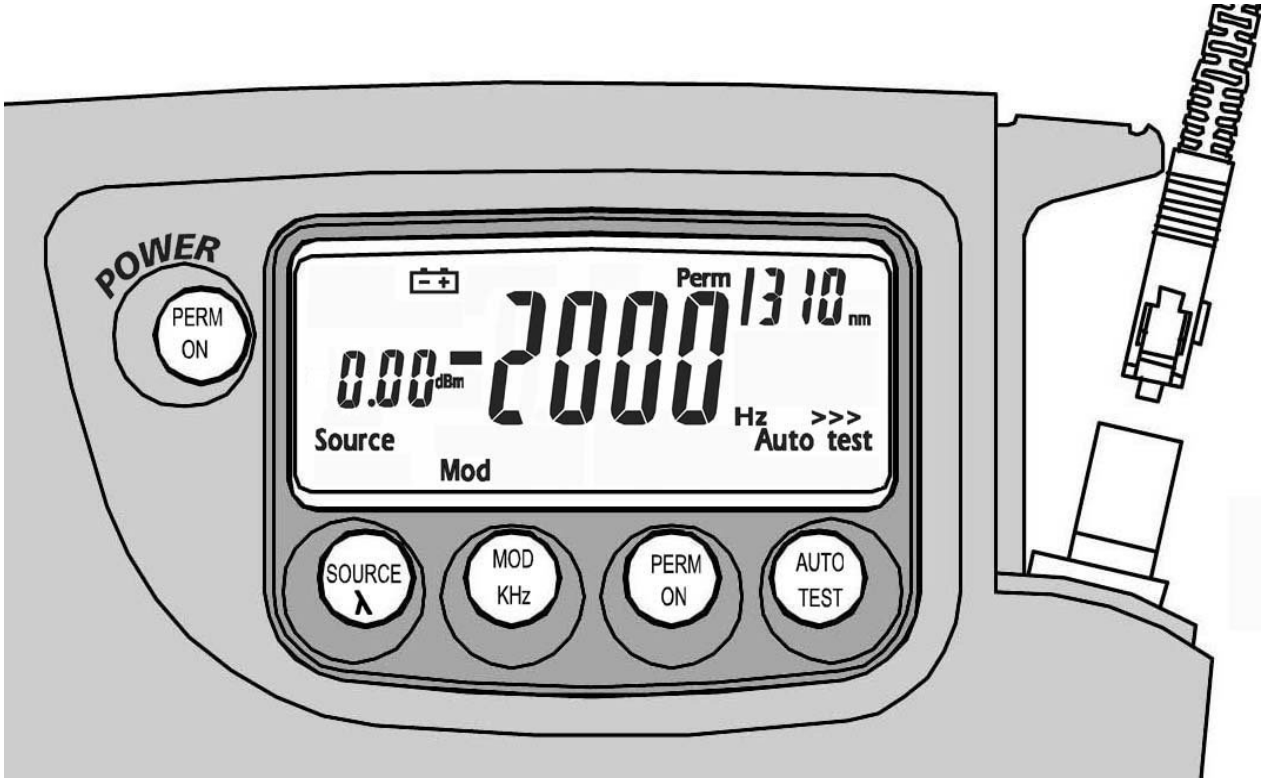
- For Autotest operation, an Autotest compatible power meter or loss test set is required.
- To start Autotest, press [Autotest] on the light source and wait a few seconds. No user action is required from the meter side.
- Autotest remains for more than 8 seconds after signal loss, to allow quick connection change.
- To exit Autotest, press [AUTO TEST] or [Menu].

MANUAL OPERATION

- To **scroll wavelengths**, press [SOURCE λ].
- To set **modulation**, press [MOD KHz].
- To adjust the **laser power level**, press and hold [PERM ON] while pressing [MOD KHz] to increase or [SOURCE λ] to decrease the output power.

  This function does not operate when in Autotest and is not available on the LED source option.

KI 3800 Series Optical Light Source



DISCLAIMER AND WARRANTY

Information in this manual is given in good faith for the benefit of the user. It cannot be used as the basis for claims against Kingfisher International or its representatives, if accidental damage or inconvenience results from use or attempted repair of the equipment.

Kingfisher International products are guaranteed against defective components and workmanship for a period of 3 years from the date of delivery, unless specifically stated in the original purchase contract or agreement. This warranty excludes optical connectors or incorrect use. Opening the instrument will invalidate the warranty. Liability is limited solely to repair of the equipment.

Technical data is subject to change without notice as part of our program of continuous improvement. Therefore please verify critical parameters before ordering. Australian and international patents granted.

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